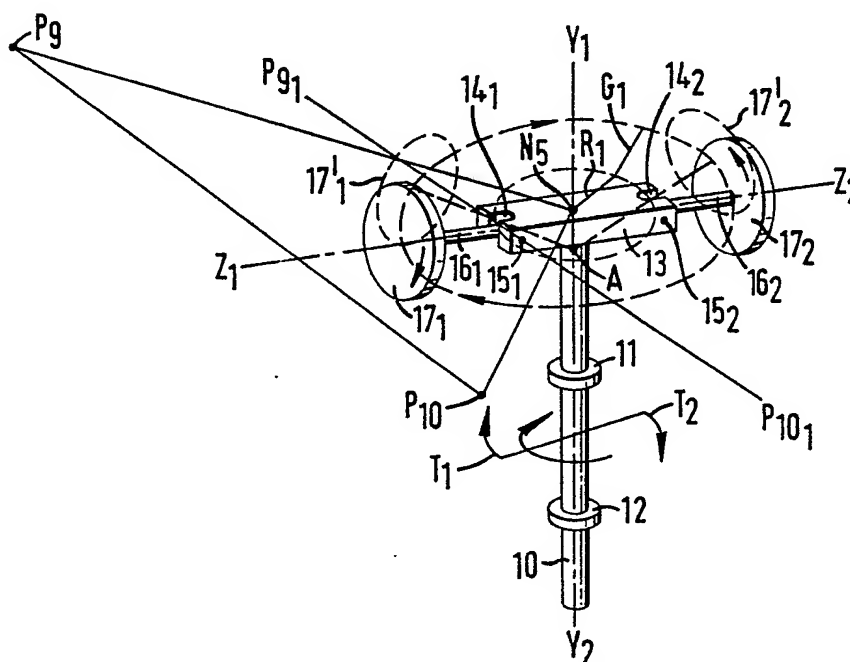


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(54) Title: IMPROVEMENTS IN OR RELATING TO A PROPULSION DEVICE



(57) Abstract

A thrust producing device comprises a support (10) to which torque can be applied. A cross member (13) fixed to the support carries rotors (17) on axels (16), the axles being pivoted to the cross member. When the torque is applied with the rotors spinning a thrust is developed.

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IMPROVEMENTS IN OR RELATING TO A PROPULSION DEVICEDESCRIPTION

This invention relates to a thrust producing device in which angular momentum is converted into a linear force for, inter alia , propulsion.

5 The device of the invention does not require the presence of a fluid medium in which to operate and the generation of the linear force is from a rotating mass.

10 According to one aspect of the present invention there is provided a thrust-producing device comprising a mass arranged to rotate about an axis of rotation that is denied the point about which it demands to precess, and is thereby constrained to translate the said point to a position where the precession does occur about said point, the translation producing a
15 linear force.

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According to a further aspect of the present invention there is provided a thrust producing device comprising a support extending substantially orthogonally from and rotatable about a first axis, a
5 rotatable mass on an axle, a pivotal connection between the axle and a position on the support spaced from the first axis and means for imparting torque to the said support about the first axis, the arrangement being that when the support is mounted to allow the
10 rotating mass to precess about the first axis and the torque applied the axle carrying the rotating mass moves about the pivotal connection and a thrust in the direction of the movement to the device as a whole may be developed.

15 Preferably there is a plurality of rotating masses and each mass may conveniently take the form of a wheel or disc essentially providing a rotor of high goodness factor, being defined as $\frac{\text{reactive momentum}}{\text{real momentum}}$
Generally the major portion of the mass will be in
20 the periphery of the rotor.

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Each of said masses may be arranged in opposition with an identical mass and rotated in opposite directions of rotation at substantially the same angular velocity.

5 Where a plurality of masses is deployed a dynamic balance is important to the success of the propulsion device.

10 The invention will now be described by way of example and with reference to the accompanying drawings wherein:-

Figure 1 is a schematic representation of a rotatable disc mounted to allow precession;

15 Figure 2 is a perspective view of a thrust-producing device in accordance with the invention;

Figure 3 is a schematic view of the device of Figure 2;

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Figure 4 is a schematic view to show how dimensional differences in the device of Figure 2 influence the thrust .

Referring initially to Figure 1 a rotor disc
5 R has a centre mounted for spinning about axis X_1X_2 on
a shaft S_1S_2 . Let us first consider the shaft S_1S_2
as being capable of pivoting about vertical axis Q_1Q_1
and horizontal axis P_1P_2 . The disc R is spun and
the shaft S_1S_2 carrying it rotates, i.e. precesses, in
10 the direction PR_1 about the axis Q_1Q_1 , this precession
being initiated by a torque. When a torque T_1T_2 is ap-
plied to the shaft in the rotational sense of preces-
sion about axis Q_1Q_1 , the shaft rotates about P_1P_2 .
Precession is taking place about N_1 i.e. about the
15 intersection of the axis of rotation of the shaft, the
axis about which the torque is applied, and the axis
about which the shaft can precess.

If, therefore, the torque axis is
transferred to the point N_2 on the intersection of
20 Q_2Q_2 and P_3P_4 , and X_1X_2 and the torque applied as

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before about Q_2Q_2 then the shaft will precess about N_2 pivoting about P_3P_4 .

This principle holds good even if torque is applied about points N_3 and N_4 spaced from the axle.

5 From the above it can be perceived that an axle will precess about an axis orthogonal to both the axis of rotation and the axis about which the torque is applied at the point where these two axes intersect.

10 An embodiment of the invention is illustrated in Figure 2.

In Figure 2 a propulsion device of the invention comprises an axle rod 10 with a longitudinal axis Y_1Y_2 and is arranged to be able to rotate in high
15 quality low friction bearings 11, 12. These bearings permit longitudinal movement to allow thrust produced to develop a working stroke. The axle 10 carries at one extremity an orthogonally disposed cross member or support 13 rigidly fixed to axle 10 as

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by welding (not shown). The cross member 13 has slots $14_1 14_2$ and pivots $15_1 15_2$ that are normal to the orthogonal line $Z_1 Z_2$ of the cross member 13.

5 To these pivots $15_1 15_2$ are attached axles $16_1 16_2$ respectively terminating in free running rotor discs $17_1 17_2$ that spin in opposite directions as shown by arrows on the discs per se. If a torque $T_1 T_2$ is now applied to the axle 10 then, from the exposition given above in regard to Figure 1, since the axis $Y_1 Y_2$ about which the torque is applied
10 cuts the axes $Z_1 Z_2$ of both rotors, $17_1 17_2$ in point N_5 , precession should take place about an axis through N_5 in the plane $N_4 P_9 P_{10_1}$ where $P_9 P_{10_1}$ is parallel to axis $P_9 P_{10}$ through pin 15_1 . (It is the same
15 mutatis mutandis for pin 15_2); but the construction is such that this is not possible without a movement of the whole device in the line $Y_1 Y_2$ such that the point N_5 is made the apex of a frusto-conical volume shown by the dotted circles in Figure 2, the radius R_1 and

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the generator G_1 ; the rotors $17_1 17_2$ rising
(or lowering) as the resultant forces dictate to the
dotted positions shown at $17'_1 17'_2$ to bring said apex

A coincident with N_5 . The identical integers of

5 Figure 2 with identical references are shown in Figure
3 for greater clarity. The movement of the whole device
is along $Y_1 Y_2$ in this instance in the direction of
arrow Y_3 . If the motion along $Y_1 Y_2$ is resisted by
frictional forces or by gravity which
10 generally is to be expected, the axle 10 will rotate
under the applied torque, work will be done and an
energy balance produced. It is to be appreciated,
however, that in the form of the device shown in
Figures 2 and 3 when the rotors $17_1 17_2$ move to
15 positions $17'_1$ and $17'_2$ the cross member 13 moves not
as is to be expected, in opposition to arrow Y_3 , but
with it in the same direction and matter is moved
without reaction and a propulsion device is
established.

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To provide for continuous propulsion a multi-phase device is essential with a separation of the phases as in an analogous electrical machine.

5 In Figure 4, it can readily be seen that if the distance l_1 (see also Figure 3) be increased to l_2 then the apical distance of the fulcrum is increased from a_1 to a_2 . Similarly if the torque $T_1 T_2$ is increased in amplitude then the angle α_1 will increase to α_2 .

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CLAIMS

1. A thrust producing device comprising a mass arranged to rotate about an axis of rotation that is denied the point about which it demands to precess, and is thereby constrained to translate the said point
5 to a position where the precession does occur about said point, the translation producing a linear force.

2. A thrust producing device comprising a support extending substantially orthogonally from and rotatable about a first axis, a rotatable mass on an
10 axle, a pivotal connection between the axle and a position on the support spaced from the first axis and means for imparting torque to the said support about the first axis, the arrangement being that when
15 the support is mounted to allow the rotating mass to precess about the first axis and the torque applied the axle carrying the rotating mass moves about the pivotal connection and a thrust in the direction of the movement to the device as a whole may be developed.

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3. A device according to Claim 2 wherein the support extends on either side of said first axis with an axle pivotal connection and rotatable mass on each extension.

5 4. A device according to Claim 3 including a plurality of supports.

5. A device according to any of the preceding claims wherein each rotatable mass is a disc with the major part of its weight in the periphery.

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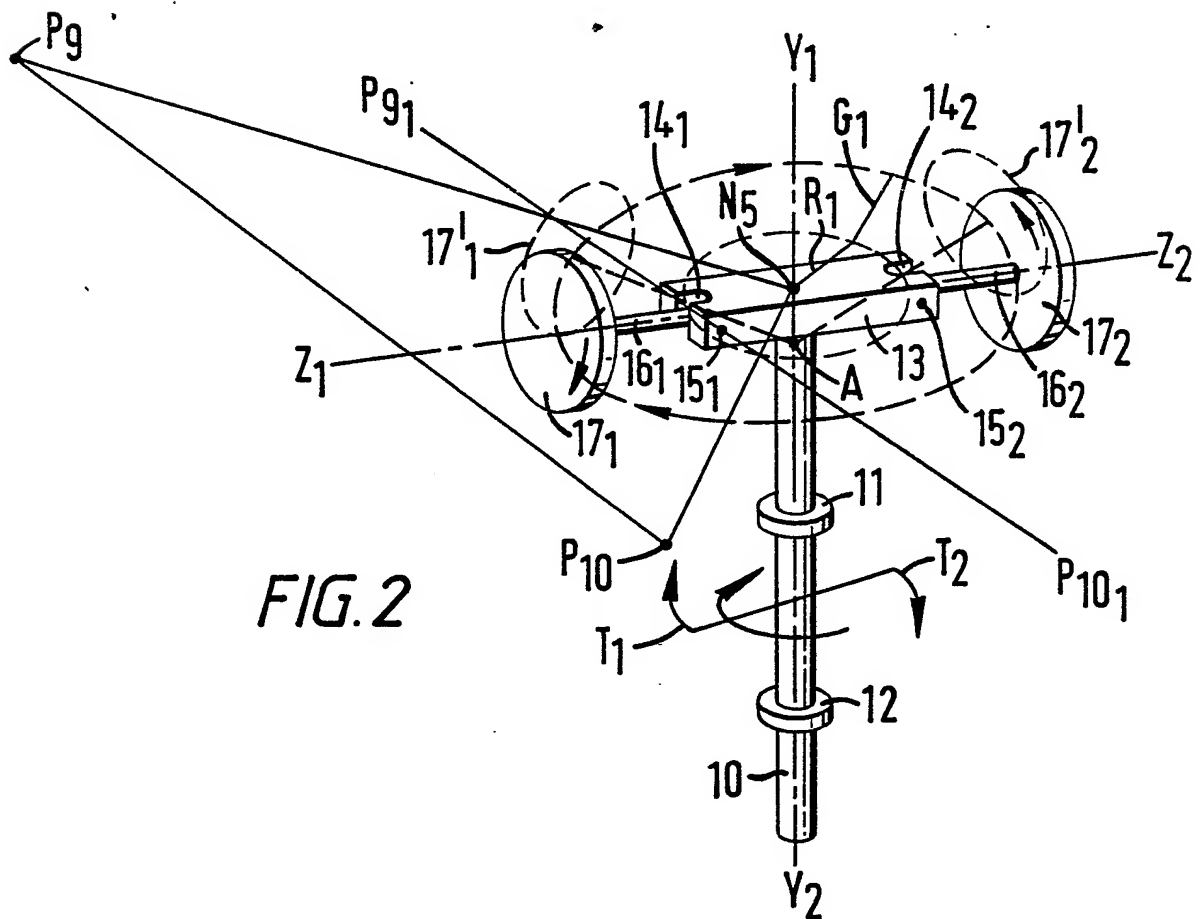
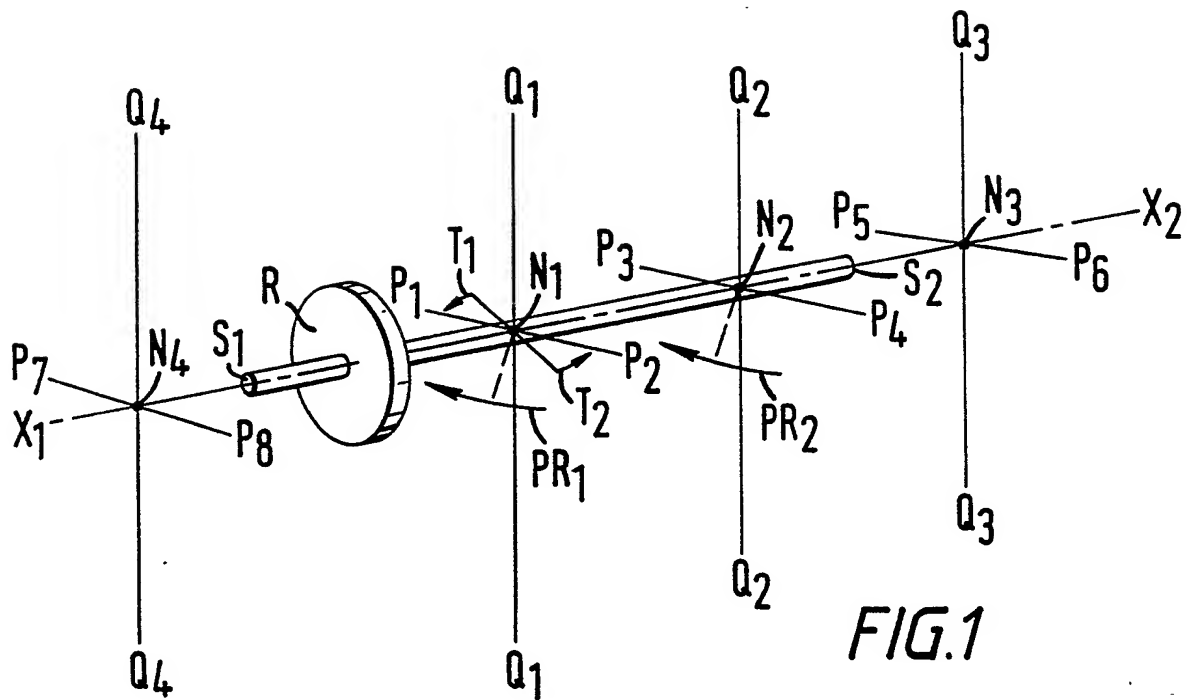
AMENDED CLAIMS

[received by the International Bureau on 12 September 1985 (12.09.85);
original claim 2 amended; other claims unchanged (2 pages)]

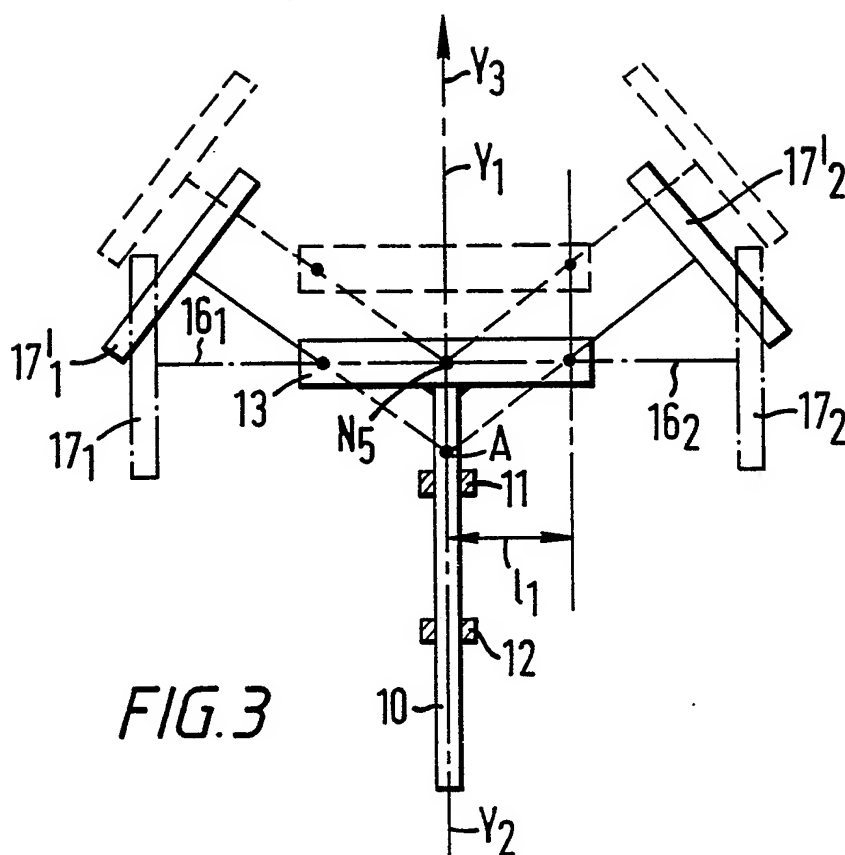
1. A thrust producing device comprising a mass
5 arranged to rotate about an axis of rotation that is
denied the point about which it demands to precess,
and is thereby constrained to translate the said point
to a position where the precession does occur about
said point, the translation producing a linear force.
- 10
2. A thrust producing device comprising a
support extending substantially orthogonally from and
rotatable about a first axis, a rotatable mass on an
axle having a pivotal connection in the plane of rotation
15 and substantially normal to a radius in said plane said
connection being between said axle and said support at a
position remote from said mass, said position being spaced
from the first axis and means for imparting torque to
the said support about the first axis, the arrangement
20 being such that when the support is rotated the
rotating mass precesses about the first axis and the
axle carrying the rotating mass moves about the
pivotal connection defining a point of precession on

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the said axis and a thrust along said first axis is developed causing the device as a whole to move along said axis and bring said defined point into the plane of rotation of the support.

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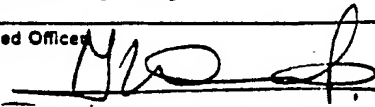
2/2



INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 86/00172

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : F 16 H 33/20		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁴	F 16 H G 01 C	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ⁸	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	DE, A, 2416283 (GROSSMAN) 16 October 1975, see page 5, line 23 - page 6, line 15	1 2-5
A	see the whole document ---	
A	FR, A, 997286 (SOCIÉTÉ E.C.A.) 3 January 1952	
A	DE, A, 2126292 (WEISSHAAR) 7 December 1972	
A	GB, A, 2090404 (G.C. RUSSELL) 7 July 1982	

<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>* Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"G" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
2nd July 1986		8 0 JUL 1986
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		M. VAN MOL 

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO.

PCT/GB 86/00172 (SA 12720)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 14/07/86

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 2416283	16/10/75	None	
FR-A- 997286		None	
DE-A- 2126292	07/12/72	None	
GB-A- 2090404	07/07/82	None	

For more details about this annex :
see Official Journal of the European Patent Office, No. 12/82

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PUBN-DATE: October 9, 1986

INVENTOR-INFORMATION:

NAME	COUNTRY
LAITHWAITE, ERIC ROBERTS	GB

ASSIGNEE-INFORMATION:

NAME	COUNTRY
LAITHWAITE ERIC ROBERTS	N/A

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APPL-DATE: March 25, 1986

PRIORITY-DATA: GB08507684A (March 25, 1985)

INT-CL (IPC): F16H033/20

EUR-CL (EPC): F16H033/20 , F03G003/08

US-CL-CURRENT: 74/84R

ABSTRACT:

A thrust producing device comprises a support (10) to which torque can be applied. A cross

member (13) fixed to the support carries rotors (17) on axels (16), the axles being pivoted to the cross member. When the torque is applied with the rotors spinning a thrust is developed.